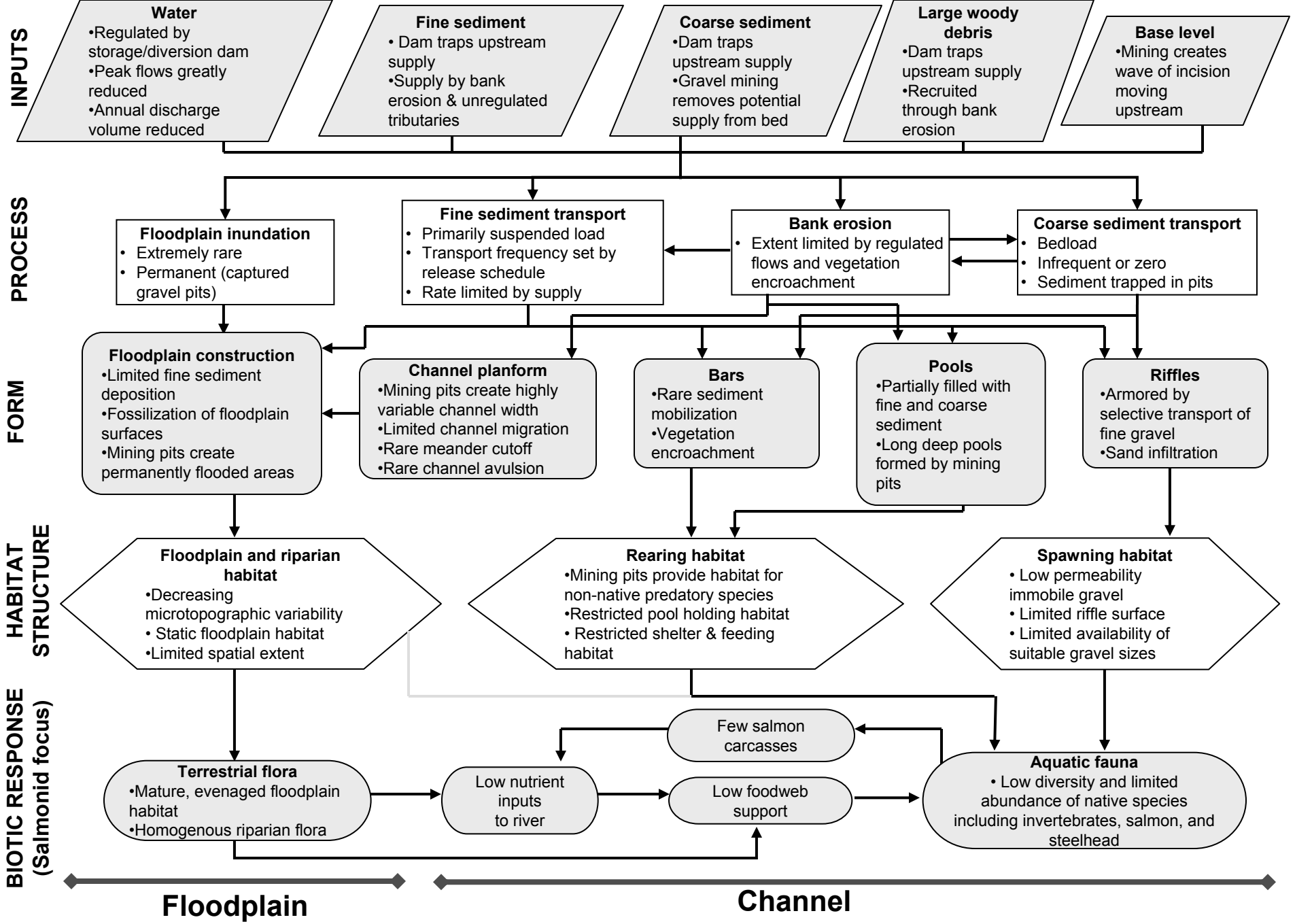

Figure 21: Gravel bed (unconfined) disturbed by dam and in-stream mining conceptual model.

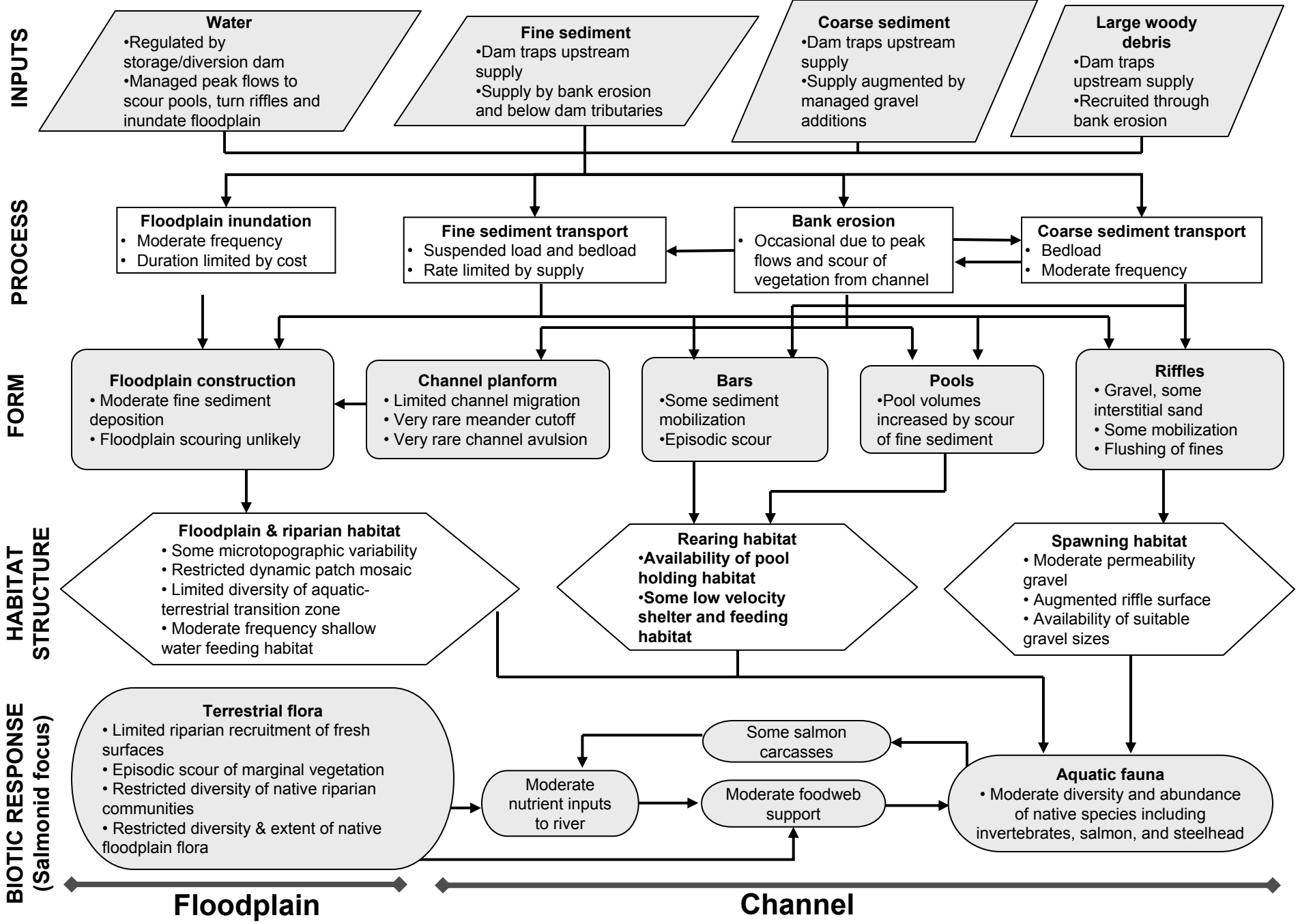

Figure 22: Gravel bed (unconfined) disturbed by dam with managed peak flows & gravel augmentation conceptual model.

1957

1998

Figure 23: Two aerial photographs of Knight's Ferry on the Stanislaus River. The 1957 photograph shows exposed bars and a wide channel with little riparian vegetation in the active channel. The photo from 1998 shows a narrow channel that is armored with riparian vegetation. These photos illustrate the channel simplification resulting from flow regulation from New Melones Dam, which was constructed in 1979. Source: Falzone (2001).

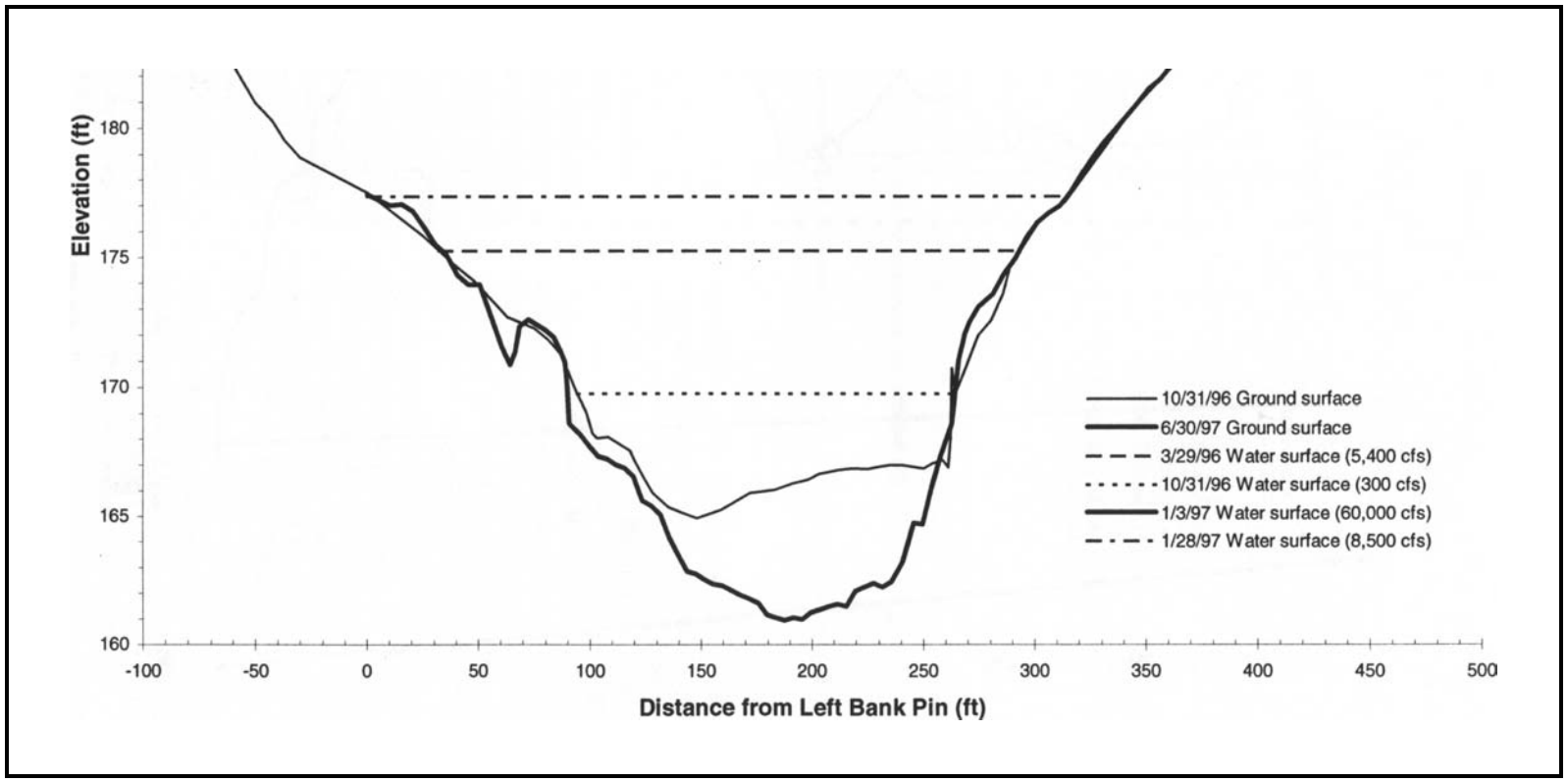

Figure 24: Pre- and post-1997 high flow cross sections showing channel down cutting on the Tuolumne River at Old La Grange Bridge (RM 50.5). Source: McBain and Trush (2000).

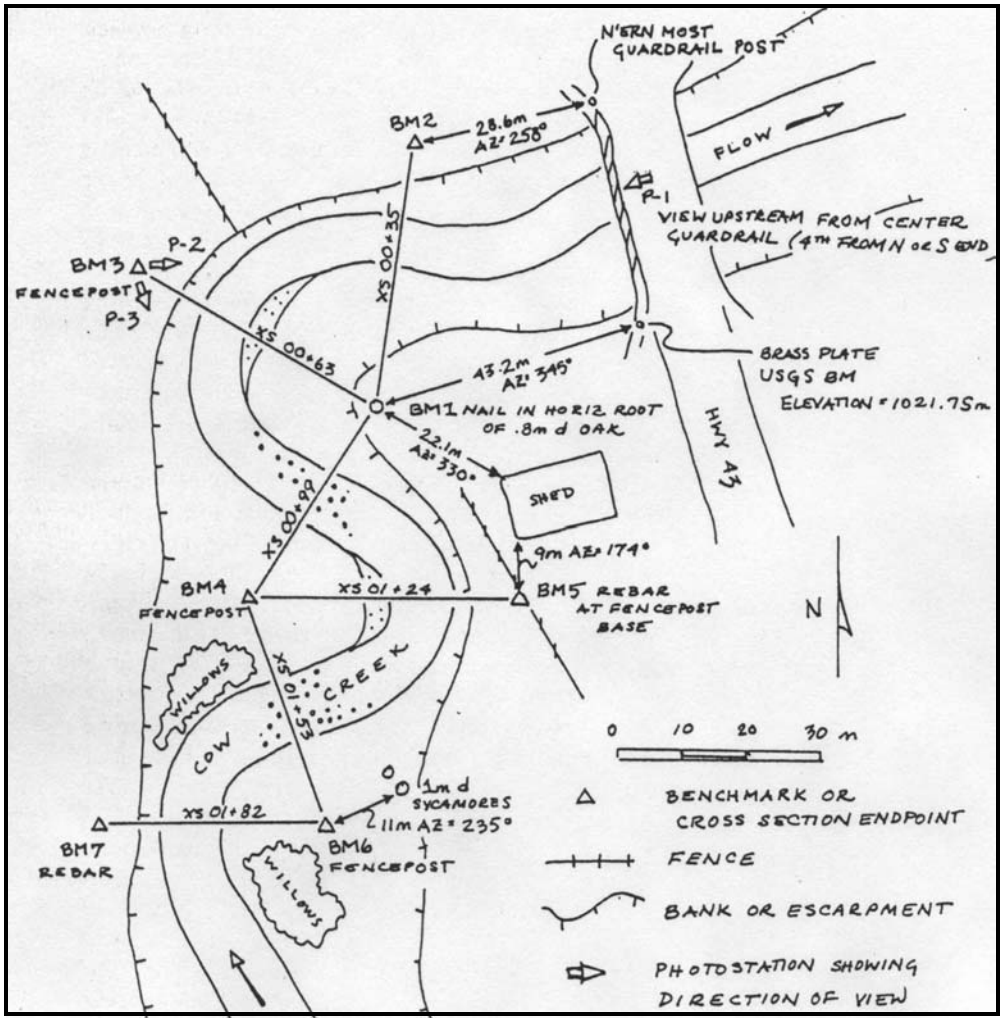

Figure 25: Example of a site map showing cross section locations and references to benchmarks from permanent features. Source: Kondolf and Micheli (1995).

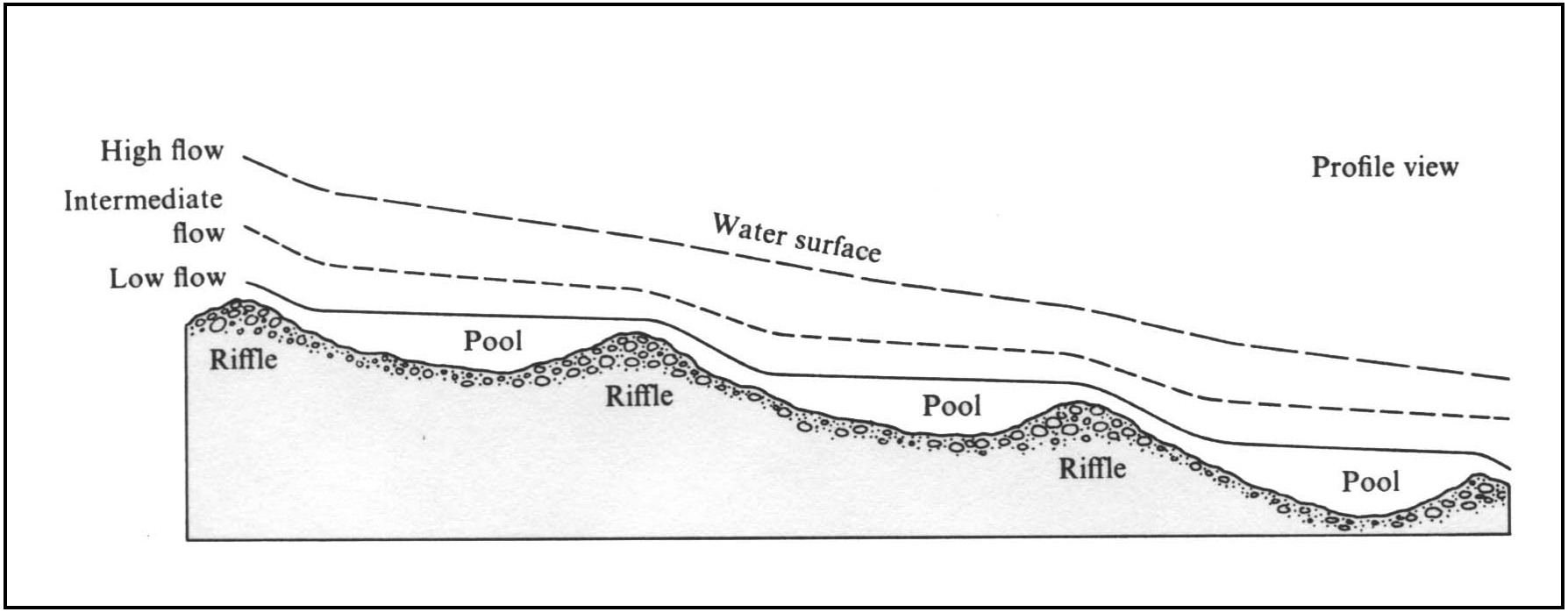

Figure 26: Simplified longitudinal profile showing morphological units and the water surface elevations at different discharges. Source: Dunne and Leopold (1978).

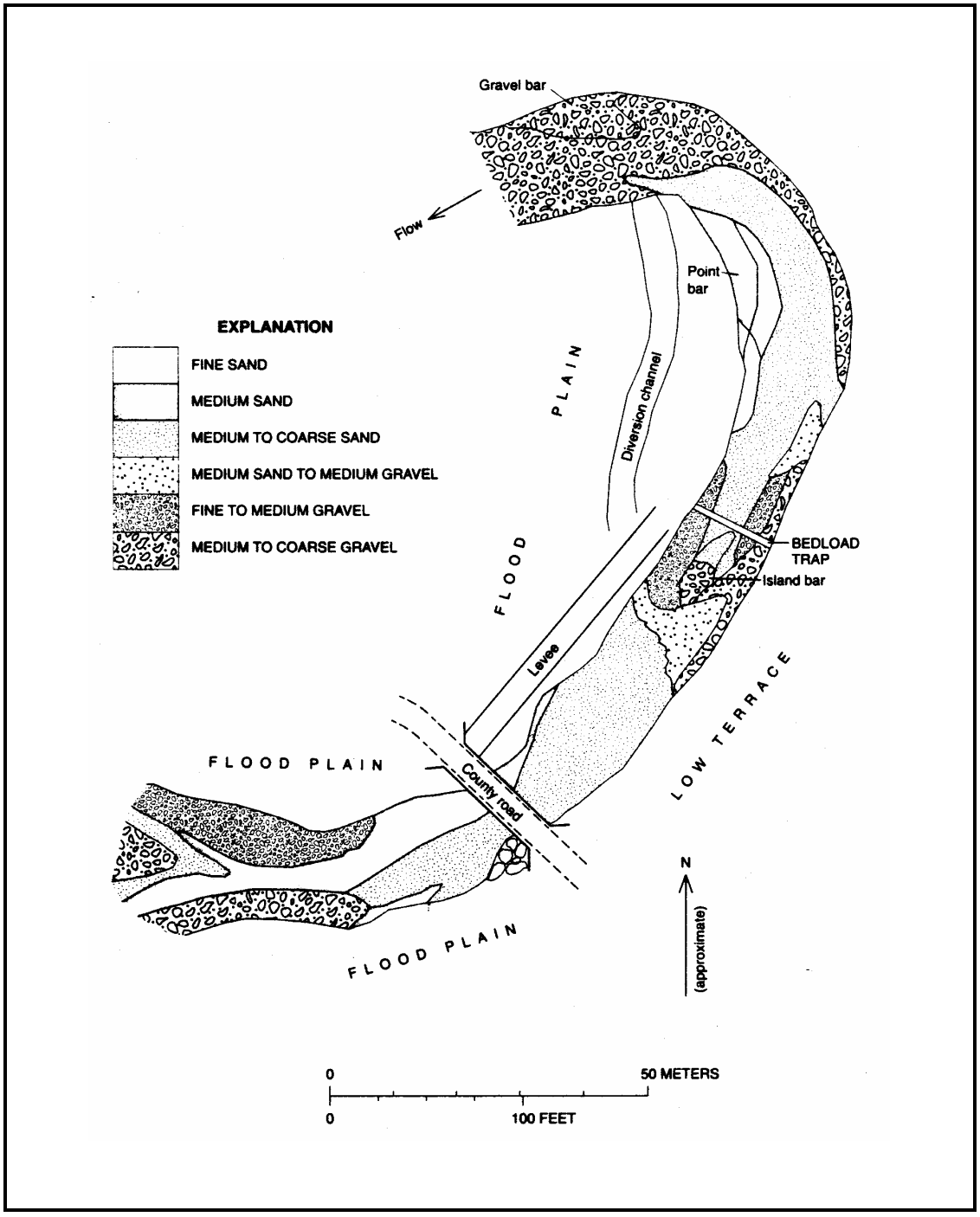

Figure 27: Facies map of bed material in the East Fork River in Wyoming. Source: Leopold and Emmett (1997).

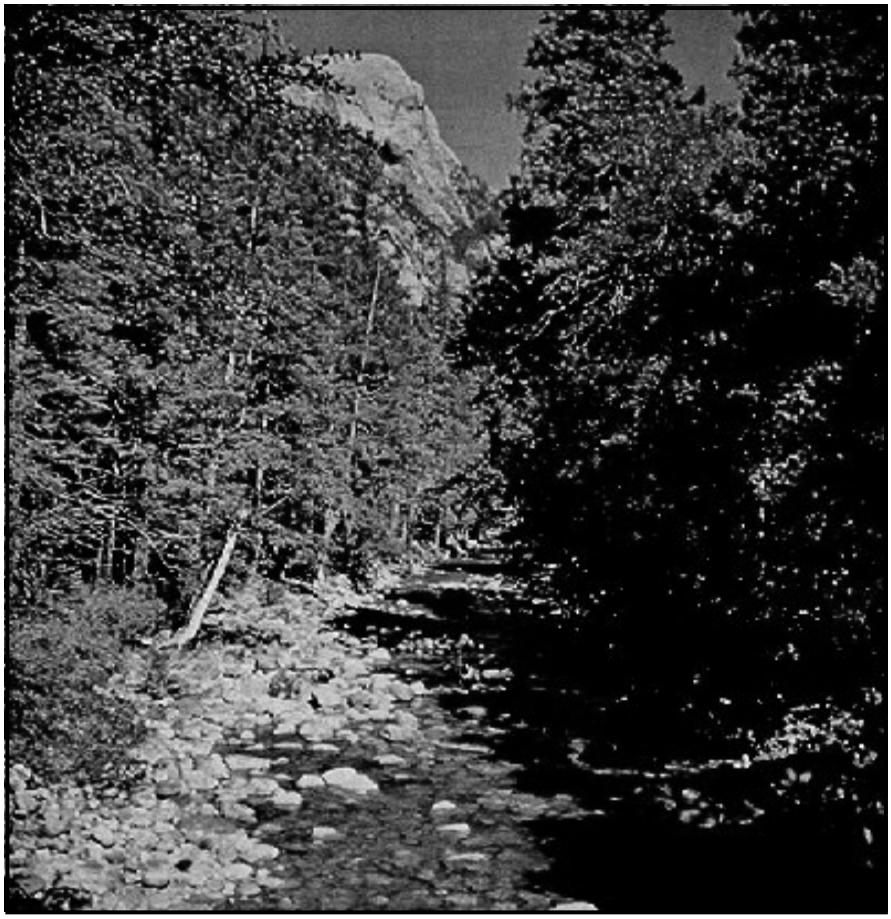

Figure 28: A reach of the Merced River, near Yosemite, California with a calculated Manning's n value of 0.065. Source: Barnes (1967).

Channel conditions		Values	
Material involved	Earth	n_0	0.020
	Rock cut		0.025
	Fine gravel		0.024
	Coarse gravel		0.028
Degree of irregularity	Smooth	n_1	0.000
	Minor		0.005
	Moderate		0.010
	Severe		0.020
Variations of channel cross section	Gradual	n_2	0.000
	Alternating occasionally		0.005
	Alternating frequently		0.010–0.015
Relative effect of obstructions	Negligible	n_3	0.000
	Minor		0.010–0.015
	Appreciable		0.020–0.030
	Severe		0.040–0.060
Vegetation	Low	n_4	0.005–0.010
	Medium		0.010–0.025
	High		0.025–0.050
	Very high		0.050–0.100
Degree of meandering	Minor	m_5	1.000
	Appreciable		1.150
	Severe		1.300

Figure 29: Cowan's (1956) table of primary factors to estimate the Manning's n roughness coefficient. Source: Chow (1959).